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NASA-03470 (June 2004)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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Superseding NASA-03470 (December 2003)

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SECTION 03470

TILT-UP PRECAST CONCRETE

06/04

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers tilt-up concrete wall panels precast on a previously prepared casting bed, usually the floor slab, and erection with a crane by tilting to a near vertical position, lifting free of the floor, and placing in final location.

This section includes various materials such as release agents, lifting and bracing inserts, cast-in accessories, special finishes, and installation as related to tilt-up construction. This section also includes form liners, placing concrete, tolerances, and erection and cleanup of panels.

This section does not include concrete materials common to all concrete work such as cements, aggregates, and lime.

Drawings must illustrate a complete design, indicating sizes of panels, reinforcing, locations of lifting inserts, connections details, and relative location of various structural members to which panels are connected, with sufficient dimensions to convey adequately the quantity and nature of the required work. Drawings must indicate whether the interior or exterior surface is cast face up.

Bolted and welded joints and connections must be indicated when these connections are required to resist applied loads.

Architectural concrete wall panels must be indicated.

Formwork, reinforcing steel, and concrete are specified in Section 03305 CAST-IN-PLACE CONCRETE (SHORT SECTION).

****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.
****

The publications listed below form a part of this section to the extent referenced:

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2004) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM C 494/C 494M (2004) Standard Specification for Chemical Admixtures for Concrete

1.2 SUBMITTALS

****
NOTE: Review submittal description (SD) definitions in Section 01330 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.
****

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

SD-02 Shop Drawings

Contractor shall submit Fabrication Drawings in accordance to specifications, with reference to contract drawings.

Installation drawings shall show connection details, reinforcing details, and lifting devices, used for the following items:

Panels
Reinforcement and Embedded Items

SD-04 Samples

Contractor shall provide samples for the following in accordance ithe the paragraph entitled, "Preparation," of this section.

Concrete Panel
Exposed Aggregate

SD-07 Certificates

Certificates shall be provided for the following items showing conformance with referenced standards contained in this section.

Facing Aggregate
Concrete Aggregates
Chemical Admixtures
Release Agent

Reinforcement steel to be used shall show conformance with referenced standards, in accordance with paragraph entitled, "Cast-In Accessories," of this section.

Pick-Up Inserts
Bracing Inserts
Reglets

1.3 QUALITY ASSURANCE

1.3.1 Erector Qualifications

Contractor shall provide an experienced supervisor for panel construction and erection having at least [2] [_____] years of successful experience in tilt-up construction, similar to the size and amount required for this project. Personnel working pursuant to this section, may at the Contracting Officer's option, be required to demonstrate technical competence by performing sample work [and/or by displaying their state qualifications/certificates], at no additional cost to the Government.

1.3.2 Tolerances

The following tolerances shall apply to this work:

****
NOTE: Tolerances may need to be changed depending on location of work.
****

Dimensional tolerances: Plus or minus 1/8 inch 3.2 millimeter in length and height, 3/16 inch 4.8 millimeter across diagonals

Bowing or warpage tolerance: Plus or minus 1/2 inch in 10 feet 12.7 millimeter in 3050 millimeter

Thickness tolerance: Plus 1/2, minus 1/8 inch 12.7, minus 3.2 millimeter

1.4 GENERAL REQUIREMENTS

****
NOTE: If Section 05095 WELDING STEEL CONSTRUCTION is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.
****

Section 05095 WELDING STEEL CONSTRUCTION applies to work specified in this

section.

1.5 SHOP DRAWINGS

Fabrication Drawings shall include dimensions of panels and size and location of openings for concrete formwork.

PART 2 PRODUCTS

2.1 RELEASE AGENT

****
NOTE: Additional finishes must be specified. Resin type agents must be used for panels to receive additional finishes.
****

[Release agent shall be resin type, containing no materials that could affect bond of subsequent finishes or natural appearance of exposed concrete surfaces.]

[Release agent shall be paraffin type.]

2.2 CAST-IN ACCESSORIES

2.2.1 Pick-Up Inserts

Inserts shall be [double] [single] type.

Inserts shall be [corrosion-resistant steel] [hot-dip galvanized].

2.2.2 Bracing Inserts

Inserts shall be [corrosion-resistant steel] [hot-dip galvanized] with a height corresponding to the thickness of the panel.

2.2.3 Reglets

****
NOTE: Select either metal or polyvinylchloride reglets. If metal reglets are required, specify either corrosion-resistance steel or hot-dip galvanized. Minimum thickness for metal reglets is 0.015 inch 0.38 millimeter.
****

Metal reglets shall be [corrosion-resistant] [hot-dip galvanized-] steel, 28-gage 0.48 millimeter, with styrofoam rigid filler.

Reglets shall be extruded polyvinylchloride with styrofoam rigid filler.

2.2.4 Sleeves

****
NOTE: Delete paragraph heading and the following two sentences if sleeves are specified under another section or if they are not required.
****

Pipe sleeves shall be furnished, size as indicated.

Sheetmetal sleeves shall be furnished, size as indicated.

2.2.5 Lifting Devices

Lifting devices shall be [angle] [swivel] type, hot-dip galvanized.

2.3 FACING AGGREGATE

****
NOTE: Delete paragraph heading and the following eight sentences when facing aggregates are not required. Select applicable option(s).
****

Aggregate shall be selected gravels.

Aggregate shall be limestone.

Facing aggregate shall be quartz.

Aggregate shall be marble.

Aggregate shall be granite.

Aggregate shall be glass.

Aggregate shall be ceramic.

Color and gradation of facing aggregates shall produce panels to match appearance of the accepted sample panel.

2.4 WATER ABSORPTION

****
NOTE: Maximum absorption is 2 percent but must not be less than the percentage obtained by testing the facing aggregates in the sample panel.
****

Water absorption of facing aggregates shall be not less than the percentage obtained by testing the facing aggregates in the approved sample panel.

2.5 CONCRETE AGGREGATES

Concrete aggregates shall conform to Section 03305 CAST-IN-PLACE CONCRETE (SHORT SECTION) except that coarse aggregate shall range from 1-1/4 to 3/8 inch 31.5 to 9.5 millimeter in size.

2.6 CHEMICAL ADMIXTURES

****
NOTE: Specify admixtures when they are not included under cast-in-place concrete.
****

Retarder admixture shall conform to ASTM C 494/C 494M, Type B.

Accelerator admixture shall conform to ASTM C 494/C 494M, Type C.

2.7 FORM LINERS

****
NOTE: Delete the paragraph heading and the following eight sentences when form liners are not required. If required, select type of liner from list below.
****

Form liners shall be rubber matting.

Form liners shall be wood boards.

Form liners shall be plywood panels.

Form liners shall be nailed-on inserts.

Form liners shall be fiberglass.

Form liners shall be plastic sheets.

Pattern of form liners shall be as selected.

No specific pattern is required.

PART 3 EXECUTION

3.1 PREPARATION

[Contractor shall cast a 4 by 4 foot 1200 by 1200 millimeter sample Concrete Panel on a casting slab to demonstrate releasing ability of release agent and architectural effects. Contrator shall also provide three test panels, 12 by 12 inches 300 by 300 millimeter of Exposed Aggregate.]

Forms and the casting slab shall be cleaned of extraneous materials. Contractor shall spackle floor joints and temporarily patch floor openings that occur in the casting area.

Casting slab shall be treated with a Release Agent before placing reinforcing and embedded items. Contractor shall use care not to scuff the release agent when placing reinforcing and embedded items.

Scuffed areas shall be retreated with the release agent, using care not to coat reinforcing and embedded items.

Contractor shall cast a 4- by 4-foot 1200 by 1200 millimeter sample Concrete Panel on a casting slab to demonstrate releasing ability of release agent and architectural effects. Contractor shall also provide three test panels, 12 inches by 12 inches 300 by 300 millimeter of Exposed Aggregate.

3.2 REINFORCEMENT AND EMBEDDED ITEMS

Reinforcing and items to be embedded in the panels shall be accurately located in accordance with approved drawings and placed into forms.

****
NOTE: Delete the following paragraph when the supporting members are not poured-in-place columns.
****

Horizontal reinforcing rods at sides of panels shall be extended a minimum of 12 inches 300 millimeter into column forms.

3.3 CASTING

Panels shall be cast individually on a temporary casting slab or may be cast on the concrete floor slab of the building at the Contractor's option. Section 03305 CAST-IN-PLACE CONCRETE (SHORT SECTION) shall apply. Concrete shall be vibrated to produce the maximum density without voids throughout the entire panel thickness. Care shall be taken not to displace reinforcement or inserts or to score forms, liners, or the casting slab.

3.4 FINISHES

Exposed face surfaces of panels shall be finished to match the approved sample panel.

****
NOTE: Select finish required for inside surface of panels.

Unexposed panel backs usually have a smooth float finish or a broom finish. When the inside surfaces are exposed, the panels can receive a smooth steel-trowel finish or light broom finish.
****

Exposed panels shall have a [smooth trowel] [light broom] finish.

Unexposed panel backs shall have a [smooth float] [broom] finish.

Cracks, voids, protrusions, spalls, or nonuniform color or texture will not be acceptable.

3.5 CURING

After casting, the Contractor shall form-cure panels until sufficient strength has developed to permit handling the units without damage.

****
NOTE: The number of days for moisture curing may be changed to meet project requirements.
****

After removal of forms, panels shall be moist-cured for a minimum of 6 calendar days.

3.6 FIELD QUALITY CONTROL

****
NOTE: Specify higher-strength concrete if required.
****

Erection of panels shall not be started until representative concrete test

cylinders have a minimum compressive strength as specified on the drawings.

Pickup points shall be located in concrete panels so that concrete tensile stresses during erection do not exceed 10 percent of the cylinder compressive strength at time of erection.

3.7 ERECTION

Setting bed for wall panels shall be leveled using high-strength mortar so that the panel in place will have a level tolerance within 1 to 500.

Panels shall be erected using spreader bars, chockers with equalizer sheaves, adjustable bracing, and other erecting accessories required to place panels in location. Bracing equipment shall meet applicable codes.

Panels shall be tilted from the casting platform to slope within 1 horizontal to 6 vertical.

Initial setting of panels shall be plumbed within 3 inches 75 millimeter of true.

Final setting of panels shall be plumbed with adjustable braces to vertical tolerance of 1 to 500, leaving braces in place until panels are secured in their final location as indicated.

****

NOTE: Panels may be connected to steel columns, precast concrete columns, or cast-in-place concrete columns. Details of connecting panels to supporting structures must be indicated. Delete paragraphs not applicable.

****

Panels shall be bolted to the supporting structure. High-strength bolts for steel construction shall be as specified in Section 05120 STRUCTURAL STEEL.

Panels shall be welded to the supporting structure.

****

NOTE: Include all the following paragraphs for welded panels.

****

Welding shall meet the requirements of AWS D1.1/D1.1M.

Before welding, surfaces shall be cleaned of loose scale, slag, rust, grease, and other foreign substances that could affect the strength of the welds.

Connections shall be welded with weld materials that correspond to the steel being welded.

Dry low-hydrogen electrodes shall be maintained for shielded metal arc welding.

Inspection gages shall be provided for checking the size, length, and quality of welds.

Contractor shall correct or replace welds having cracks, surface porosity, slag accumulation, insufficient throat, or concavity.

Weld splatter shall be removed from steel surfaces to be painted.

Panels shall be braced with adjustable turnbuckle pipe braces or timber braces.

****
NOTE: Select either plastic or portland mortar. Portland mortar (dry-packing) is recommended for tighter joints.
****

Joints between wall panels and foundation and wall panels and columns shall be packed with [portland cement] [plastic] mortar.

3.8 PATCHING

Holes in panels left after lifting rigging has been removed shall be dry-packed with nonshrink mortar to match adjacent surfaces.

****
NOTE: Select one of the following paragraphs.

Specify sack-rubbed cleaning when surface air pockets and minor rust stains occur.

Specify acid-cleaning solution when stains are caused by rust from reinforcing and impurities in curing water.
****

[Contractor shall wet stained surfaces, coat surfaces with a thick mortar mixture, and rub the area with burlap pads to remove the excess mortar and fill surface voids.]

[Contractor shall remove surface stains with diluted muriatic acid, scrubbing with stiff brushes and flushing with clean water.]

-- End of Section --